# Space Exposure for Structural-Health Aware Materials Experiment (SESAME), Phase I

Completed Technology Project (2018 - 2019)

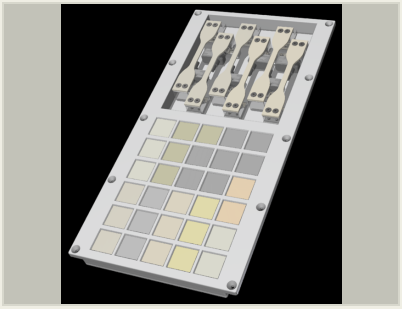
## Project Introduction

NASA has outlined a bold vision for future exploration on the Moon and Mars. Structural health monitoring (SHM) provides numerous benefits to these future missions, including increased reliability, reduced maintenance cost, and increased mission safety. Structural health monitoring (SHM) provides numerous benefits to future NASA missions, including increased reliability, reduced maintenance cost, and increased mission safety. Made In Space (MIS) has developed a suite of Structural-Health Aware Fault-Tolerant Engineered to Respond (SAFER) materials through an active Phase I STTR project to provide SHM capabilities. MIS has successfully demonstrated the SAFER materials through lab testing. The next step in the development of these materials is a demo in space, including exposure to the LEO environment as well as exposure to stimuli representing loading cases. MISSE-FF provides a platform for in-space characterization of the SAFER materials. MIS has developed an innovative Space Exposure for Structural-Health Aware Materials Experiment (SESAME) to expose the SAFER materials to the combined effects of the LEO environment and cyclic loading. SESAME is an active experiment intended to integrate with the sample deck of the standard MISSE Sample Carrier. SESAME is an innovative MISSE-FF payload for exposing and testing candidate materials for structural health monitoring on future space exploration missions. SESAME uses standard MISSE-FF power and data interfaces to simplify integration of the active experiment into existing ISS infrastructure. Space exposure is critical for further development of candidate structural health monitoring materials that will be used in future missions. The materials being proposed for SESAME testing have unique material properties that may be affected by space exposure. Fully characterizing the effect of space exposure will help manufacturers and designers better use these smart materials for greater impact on future space flight missions.

## Anticipated Benefits

Active monitoring of spacecraft is beneficial to NASA for human flight missions. Launch incurs a large amount of stress on all parts constituting the spacecraft, and operations in orbit also result in loads on the spacecraft. Using the SAFER materials further developed by SESAME to monitor the spacecraft can identify where structures or parts of the spacecraft are weakened, allowing for repair or reinforcement. SESAME contributes to mission resilience and positively impacts future missions.

A similar application to NASA spacecraft are various aerospace vehicles used by the DOD. The USAF has many critical parts on aircraft and spacecraft could benefit from further development of SAFER materials by SESAME. The USN could benefit from applying SAFER materials to ships and submarines in various high pressure, high stress locations. The commercial sector could apply SAFER materials in the same manner as NASA and DOD by using the materials on vehicles and pressure vessels.



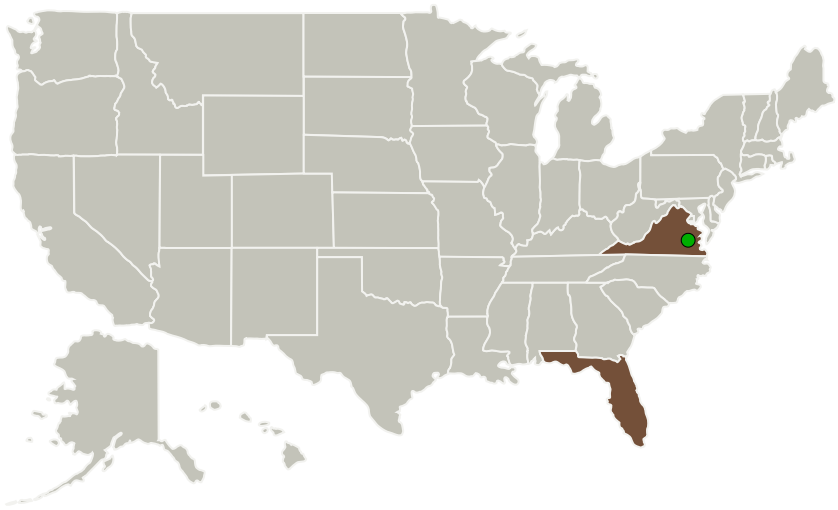
Space Exposure for Structural-Health Aware Materials Experiment (SESAME), Phase I

## Table of Contents

# Space Exposure for Structural-Health Aware Materials Experiment (SESAME), Phase I

Completed Technology Project (2018 - 2019)

## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| Made in Space, Inc. | Lead Organization | Industry | JACKSONVILLE, Florida |
| Langley Research Center(LaRC) | Supporting Organization | NASA Center | Hampton, Virginia |

| Primary U.S. Work Locations | |
|---|---|
| Florida | Virginia |

## Project Transitions

**July 2018:** Project Start

**February 2019:** Closed out

**Closeout Documentation:**

- Final Summary Chart*(https://techport.nasa.gov/file/137909)*

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Made in Space, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

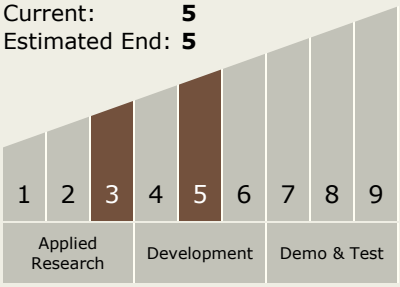
Carlos Torrez

**Principal Investigator:**

Derek Thomas

## Technology Maturity (TRL)

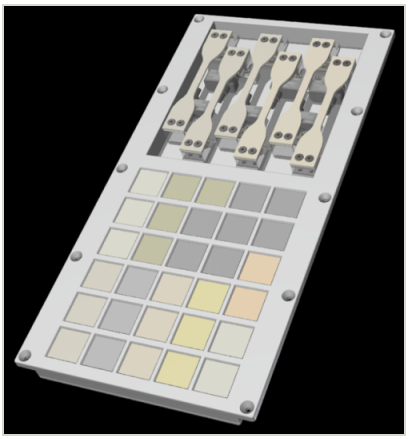
Start: **3**
Current: **5**
Estimated End: **5**



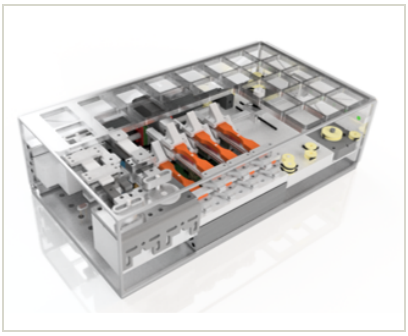
# Space Exposure for Structural-Health Aware Materials Experiment (SESAME), Phase I

Completed Technology Project (2018 - 2019)

## Images



**Briefing Chart Image**
Space Exposure for Structural-Health Aware Materials Experiment (SESAME), Phase I
*(https://techport.nasa.gov/image/137180)*



**Final Summary Chart Image**
Space Exposure for Structural-Health Aware Materials Experiment (SESAME), Phase I
*(https://techport.nasa.gov/image/135888)*

## Technology Areas

**Primary:**

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.3 Reliability and Sustainment

## Target Destinations

Earth, The Moon, Mars